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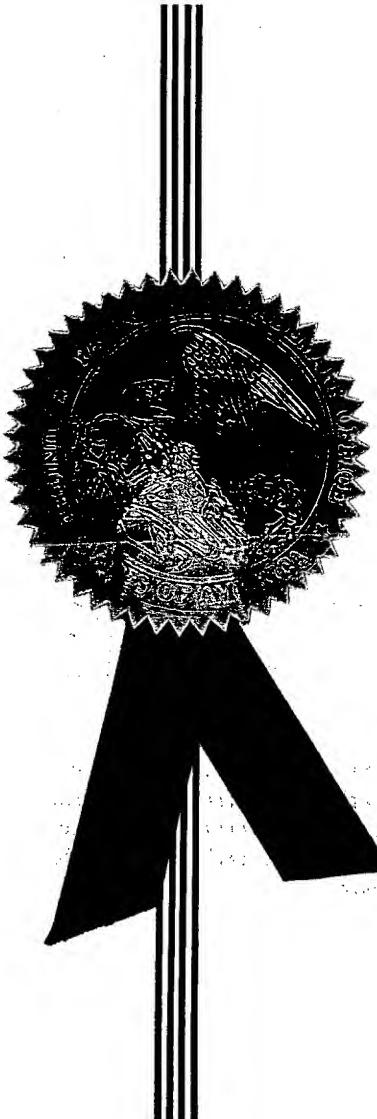
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08/05/899 1250

The  
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The Commissioner of Patents  
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*Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.*

*Therefore, this*

United States Patent

*Grants to the person or persons having title to this patent the right to exclude others from making, using or selling the invention throughout the United States of America for the term of seventeen years from the date of this patent, subject to the payment of maintenance fees as provided by law.*

*Harry F. Manbeck, Jr.*

Commissioner of Patents and Trademarks

*Priscilla A. Fuller*

*Attest*

## **NOTICE**

*If the application for this patent was filed on or after December 12, 1980, maintenance fees are due three years and six months, seven years and six months, and eleven years and six months after the date of this grant, or within a grace period of six months thereafter upon payment of a surcharge as provided by law. The amount, number, and timing of the maintenance fees required may be changed by law or regulation.*

# United States Patent [19]

Bocchi et al.

[11] Patent Number: 4,998,531

[45] Date of Patent: Mar. 12, 1991

[54] **IMPLANTABLE N-PHASIC DEFIBRILLATOR OUTPUT BRIDGE CIRCUIT**

[75] Inventors: David E. Bocchi, Vadnais Heights; Jeffrey T. Laackman, Isanti; Stanley M. Bach, Jr., Shoreview, all of Minn.

[73] Assignee: Cardiac Pacemakers, Inc., St. Paul, Minn.

[21] Appl. No.: 501,527

[22] Filed: Mar. 28, 1990

[51] Int. Cl. 5 ..... A61N 1/00

[52] U.S. Cl. .... 128/419 D

[58] Field of Search ..... 128/419 D, 419 PG, 419 P

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[57] ABSTRACT

An output bridge circuit comprising four independently controlled transistors connected between first and second electrode terminals and a defibrillation capacitor. Two of the four transistors are driven by push-pull driver circuits and connected between the capacitor and the first and second electrode terminals. The remaining two transistors are connected between the first and second electrode terminals and ground terminals. By triggering one of the transistors connected to the push-pull driver circuits and one of the transistors connected between the electrode terminals and the ground terminal, a mono-phasic, multi-phasic, or sequential defibrillation pulse can be generated by activating the appropriate transistors.

5 Claims, 6 Drawing Sheets

